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(54) **Detergent compositions.**

(57) Detergent compositions containing primary alkyl sulphate and/or nonionic surfactant also contain alkane 1,2-diol. This leads to improved oily soil detergency when certain requirements as to proportions are complied with. Nonionic surfactant may be ethoxylated fatty alcohol. Alkylpolyglycoside is also possible.

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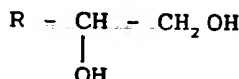
This invention relates to a detergent composition, especially but not exclusively, to built compositions suitable for the washing of fabrics.

Fabric washing compositions traditionally contain one or more detergent active materials in addition to various other ingredients such as detergency builders, bleaches, fluorescers, perfumes etc. Notable applications of detergent compositions are to clean fabrics, usually by washing portable fabric items in a bowl or in a washing machine, to clean crockery and cooking utensils, again by washing in a bowl (hand dishwashing), and to clean hard surfaces such as glass, glazed surfaces, plastics, metals and enamels. A number of different detergent active materials have been proposed in the art.

We have now found that a synergistic enhancement of oily/fatty soil removal can be achieved if certain surfactants are used in certain combinations.

Accordingly, the present invention provides a built detergent composition for washing fabrics containing 2 to 50% by weight of a surfactant mixture which comprises

i) a 1,2-diol of the general formula



where R is a saturated or unsaturated hydrocarbyl group containing 8 to 16 carbon atoms,

ii) one or more other surfactants selected from

a) primary alkyl sulphates of formula



in which R^a is a saturated, unsubstituted, branched or straight chain primary alkyl or alkenyl group containing 8 to 16 carbon atoms and M is a solubilizing cation;

b) nonionic surfactants with an HLB value of 10.5 or above, preferably 12.0 or above; with the amounts by weight of (i), (a) and (b) such that either the amount of (b) is greater than 50% of (i) and (ii)

in which case (i) is from 5 to 40% of (i) and (ii) while (a) is not more than 25% of (i) and (ii), with the proviso that (i) is at least 10% of (i) and (ii) if (a) is from 15 to 25% of (i) and (ii);

or the amount of (b) is less than 40% of (i) and (ii)

in which case (i) is at least 5% of (i) and (ii) while (a) is at least 70% of (i) and (ii) and (b) is less than 10% of (i) and (ii)

or else (i) is from 20 to 40% of (i) and (ii) while (a):(b) ranges from 40:60 to 70:30;

and with the proviso that the amount of any other non-soap anionic surfactant in the composition is less than half the weight of said primary alkyl sulphate (a).

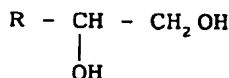
We have found that within these specified ranges of compositions the diol and the other surfactant(s) generally give a synergistic enhancement of oily soil removal, giving greater removal of oily soil than is found with compositions of the same surfactants which are somewhat similar but outside the specified ranges.

It should be appreciated that this enhanced detergency is an improvement relative to somewhat analogous compositions. Thus for example a composition in accordance with the invention which is rich in primary alkyl sulphate, contains some diol and possibly a small quantity of ethoxylated alcohol may possess better oily soil detergency than either primary alkyl sulphate or the diol alone yet not be as good as the ethoxylated alcohol alone.

Nevertheless, such a composition which is rich in primary alkyl sulphate may be preferred over the ethoxylated alcohol for other reasons, such as ability to formulate a solid product, ability to generate foam or effectiveness against other soils.

The various materials which are, or may be, included in compositions of this invention will now be considered by turn.

It is envisaged that the hydrocarbyl group R in the general formula



will generally be alkyl or alkenyl of 8 to 16 carbon atoms, preferably 8 to 12. 1,2-Alkane diols are known compounds and can be prepared by standard methods for the preparation of diols. They can be manufactured from terminal olefins by epoxidation and then hydrolysis.

Other possibilities for the group R include cycloaliphatic groups and aromatic-aliphatic groups such as

phenylethyl or dimethyl phenyl.

Possible primary alkyl sulphates (a), also known as sulphated fatty alcohol salts, include those of mixed alkyl chain length, in which the ratio of C₁₂ alkyl chains to C₁₈ alkyl chains is in the range of from 9:4 to 1:6. A suitable material can be obtained from a mixture of synthetic lauryl and oleyl alcohols in appropriate proportions.

5 The solubilizing cation of the alkyl sulphates is preferably an alkali metal, notably sodium or potassium.

One possibility for the nonionic surfactant (b) is ethoxylated nonionic surfactants for which the average number of ethylene oxide residues is high enough to yield an HLB value of at least 11.0. These may in particular be ethoxylated alcohols. In such compounds the alcohol generally contains from 9 to 15 carbon atoms.

Another possibility is alkyl polyglycosides of general formula

10
$$R^2O(R^3O)_t(G)_x$$

provided the value of x is sufficiently high to give an HLB of at least 11. In the general formula

$$R^2O(R^3O)_t(G)_x$$

the hydrophobic group R³ is preferably aliphatic, either saturated or unsaturated, notably straight or branched alkyl, alkenyl, hydroxyalkyl or hydroxyalkenyl. However, it may include an aryl group for example alkyl-aryl, alkenyl-aryl and hydroxyalkyl-aryl. Particularly preferred is that R is alkyl or alkenyl of 8 to 16 carbon atoms.

15 The value of t in the general formula above is preferably zero, so that the -(RO)_t - unit of the general formula is absent. In that case the general formula becomes

$$RO(G)_x$$

20 If t is non-zero it is preferred that R³O is an ethylene oxide residue. Other likely possibilities are propylene oxide and glycerol residues. If the parameter t is non-zero so that R'O is present, the value of t (which may be an average value) will preferably lie in the range from 0.5 to 3.

The group G is typically derived from fructose, glucose, mannose, galactose, talose, gulose, allose, altrose, idose, arabinose, xylose, lyxose and/or ribose. Preferably, the G is provided substantially exclusively by glucose units.

25 The value x, which is an average, is usually termed the degree of polymerization. Desirably x varies between 1 and 8. Values of x may lie between 1 and 3, especially 1 and 1.8.

Polyglycosides of particular interest have x in the narrow range from 1 or 1.2 up to 1.4 or especially 1.3. If x exceeds 1.3 it preferably lies in the range 1.3 or 1.4 to 1.8.

When x lies in the range 1 to 1.4 it is preferred that R is C₈ to C₁₄ alkyl or alkenyl.

30 The requirements of this invention, as stipulated above, signify that the surfactant mixture may be

diol (i) with primary alkyl sulphate (a)

diol (i) with nonionic surfactant (b)

diol (i) with both of (a) and (b).

35 In this third case, however, the amounts of (a) and (b) must comply with certain limits which require, in qualitative terms a mixture in which (a) or (b) is preponderant over the other, or a mixture in which the amounts of (a) and (b) are not too far from being equal. This latter possibility is a range of 40:60 to 70:30.

Mixtures of nonionic surfactants may be used. So, nonionic surfactant (b) may, for example, be an ethoxylated nonionic or an alkylpolyglycoside (each as specified above) or a mixture of the two.

40 Detergent compositions of the invention may contain yet further surfactants, outside the definitions specified for (i) and (ii). However, the proviso stated above, limits the amount of non-soap anionic surfactant other than primary alkyl sulphate. In general the presence of additional surfactants is not preferred, since it may harm the desired synergy. Consequently, the amount of any surfactants other than (i) and (ii) as defined is likely to be less than 50% by weight better less than 25% or even 10%, of the surfactant mixture.

45 Additional surfactant, if present, may be anionic, nonionic or amphoteric. Cationic surfactant is possible, especially if anionic surfactant is absent but is preferably excluded.

Detergent compositions of the invention also contain detergency builder. Generally the amount of detergency builder is from 7 to 70% by weight of the composition.

If a detergent composition of this invention is in solid form, the composition is likely to contain at least 10 or 15% of builder.

50 It is desirable that the compositions according to the invention be approximately neutral or preferably alkaline, that is when the composition is dissolved in an amount to give surfactant concentration of 1 g/l in distilled water at 25°C the pH should desirably be at least 7.5. For solid compositions the pH will usually be greater, such as at least 9. To achieve the required pH, the compositions may include a water-soluble alkaline salt. This salt may be a detergency builder (as described in more detail below) or a non-building alkaline material.

55 When the compositions of the invention contain a detergency builder material, this may be any material capable of reducing the level of free calcium ions in the wash liquor and will preferably provide the compositions with other beneficial properties such as the generation of an alkaline pH and the suspension of soil removed from the fabric.

Examples of phosphorus-containing inorganic detergency builders, when present, include the water-soluble salts, especially alkali metal pyrophosphates, orthophosphates, polyphosphates and phosphonates. Specific examples of inorganic phosphate builders include sodium and potassium triphosphates, orthophosphates and hexametaphosphates.

5 Examples of non-phosphorus-containing inorganic detergency builders, when present, include water-soluble alkali metal carbonates, bicarbonates, silicates and crystalline and amorphous aluminosilicates. Specific examples include sodium carbonate (with or without calcite seeds), potassium carbonate (with or without calcite seeds), sodium and potassium bicarbonates and silicates.

10 Examples of organic detergency builders, when present include the alkali metal, ammonium and substituted ammonium polyacetates, carboxylates, polycarboxylates, polyacetyl carboxylates and polyhydroxysulphonates. Specific examples include sodium, potassium, lithium, ammonium and substituted ammonium salts of ethylenediaminetetraacetic acid, nitrilotriacetic acid, oxydisuccinic acid, melitic acid, benzene polycarboxylic acids and citric acid. Further possibilities are tartrate monosuccinates, tartrate disuccinates, dipicolinic acid, cheledamic acid, carboxy methoxysuccinate and hydroxyethyliminodiacetic acid.

15 Apart from the ingredients already mentioned, a number of optional ingredients may also be present. Examples of other ingredients which may be present in the composition are polymers containing carboxylic or sulfonic acid groups in acid form or wholly or partially neutralised to sodium or potassium salts, the sodium salts being preferred. Preferred polymers are homopolymers and copolymers of acrylic acid and/or maleic acid or maleic anhydride. Of especial interest are polyacrylates, polyalpha-hydroxyacrylates, acrylic/maleic acid 20 copolymers, and acrylic phosphinates.

The molecular weights of homopolymers and copolymers are generally 1000 to 150,000, preferably 1500 to 100,000. The amount of any polymer may lie in the range from 0.5 to 5% by weight of the composition. Other suitable polymeric materials are cellulose ethers such as carboxy methyl cellulose, methyl cellulose, hydroxy alkyl celluloses, and mixed ethers, such as methyl hydroxy ethyl cellulose, methyl hydroxy propyl cellulose, 25 and methyl carboxy methyl cellulose. Mixtures of different cellulose ethers, particularly mixtures of carboxy methyl cellulose and methyl cellulose, are suitable. Polyethylene glycol of molecular weight from 400 to 50,000, preferably from 1000 to 10,000, and copolymers of polyethylene oxide with polypropylene oxide are suitable as also are copolymers of polyacrylate with polyethylene glycol. Polyvinyl pyrrolidone of molecular weight of 10,000 to 60,000 preferably of 30,000 to 50,000 and copolymers of polyvinyl pyrrolidone with other poly pyrrolidones are suitable. Polyacrylic phosphinates and related copolymers of molecular weight 1000 to 100,000, 30 in particular 3000 to 30,000 are also suitable.

Further examples of other ingredients which may be present in the composition include fabric softening agents such as fatty amines, fabric softening clay materials, lather boosters such as alkanolamides, particularly the monoethanolamides derived from palm kernel fatty acids and coconut fatty acids, lather depressants, oxygen-releasing bleaching agents such as sodium perborate and sodium percarbonate, typically accompanied 35 by peracid bleach precursors, organic peracids, chlorine-releasing bleaching agents such as trichloroisocyanuric acid, inorganic salts such as sodium sulphate, and, usually present in very minor amounts, fluorescent agents, perfumes including deodorant perfumes, enzymes such as cellulases, proteases, lipases and amylases, germicides and colourants.

40 The detergent compositions according to the invention may be in any suitable form including powders, bars, liquids and pastes. For example suitable liquid compositions may be non-aqueous or aqueous, the latter being either isotropic or lamellar structured. The compositions may be prepared by a number of different methods according to their physical form. In the case of granular products they may be prepared by dry-mixing, coagglomeration, spray-drying from an aqueous slurry or any combination of these methods.

45 One preferred physical form is a granule incorporating a detergency builder salt. This may be prepared by conventional granulation techniques or spray drying.

Another preferred physical form is a lamellar structured aqueous liquid, for heavy duty fabrics washing, in which the surfactant mixture provides structure capable of suspending particulate solids. For such forms in particular the surfactant (ii) may be nonionic surfactant (b). The aqueous continuous phase of such a liquid will 50 usually contain dissolved electrolyte. Electrolyte may be dissolved only in the aqueous continuous phase or may also be present as suspended solid particles. Particles of solid materials which are insoluble in the aqueous phase may be suspended alternatively or in addition to any solid electrolyte particles.

Three common product forms which are liquid are liquids for heavy duty fabrics washing, liquid abrasive cleaners and general purpose cleaners. In the first class, the suspended solid can comprise suspended solids 55 which are substantially the same as the dissolved electrolyte, being an excess of same beyond the solubility limit. This solid is usually present as a detergency builder, i.e. to counteract the effects of calcium ion water hardness in the wash. In the second class, the suspended solid usually comprises a particulate abrasive, insoluble in the system. In that case the electrolyte, present to contribute to the structuring of the active material in

the dispersed phase, is generally different from the abrasive compounds. In certain cases, the abrasive can however comprise partially soluble salts which dissolve when the product is diluted. In the third class, the structure is usually used for thickening the product to give consumer-preferred flow properties, and sometimes to suspend pigment particles.

5 In the following examples the parts and percentages are by weight. Figures 1 and 2 are triangular plots of results from Examples 3 and 7.

Example 1

10 Compositions were prepared having as a general formulation:

| | | |
|----|--------------------------------|-----------------|
| | Detergent active | 13 |
| | Zeolite | 24 |
| 15 | Sodium silicate | 0.8 |
| | Sokolan CP5 | 4 |
| 20 | Sodium carbonate (anhydrous) | 12 |
| | Sodium carboxymethyl cellulose | 0.5 |
| | Sodium metaborate | 11 |
| 25 | Water | balance to 100% |

Sokolan CP5 is an acrylic/maleic copolymer available from BASF.

30 The detergent active was provided by various proportions of Dodecane 1,2-diol available from Aldrich Chemical Co. and Synperonic A7 available from I.C.I. Synperonic A7 is a C₁₃-C₁₅ alcohol ethoxylated with an average of seven ethylene oxide residues. It has an HLB of 11.7.

The compositions were added to 24°FH water at a concentration of 6g/litre. The resulting wash liquors had a pH of 10 and were used to wash polyester test cloths soiled with radiolabelled triolein. Washing was carried out at 40°C for 20 minutes in a Tergotometer.

35 The removal of radiolabelled triolein was determined and the results were:

| | Ratio | % Triolein removal |
|----|--------------------------|--------------------|
| 40 | Synperonic A7 : 1,2-diol | |
| | 100:0 | 68.9 |
| | 85:15 | 74.5 |
| 45 | 69:31 | 62.7 |
| | 54:36 | 13.7 |

50 Example 2

Compositions were prepared having as a general formulation:

55

| | | % by weight |
|----|------------------------------|-----------------|
| | Detergent active | 13 |
| 5 | Zeolite | 24 |
| | Sodium silicate | 0.8 |
| | Sokolan CP5 | 4 |
| 10 | Sodium carbonate (anhydrous) | 10 |
| | Sodium sulphate | 20 |
| 15 | Sodium metaborate | 11 |
| | Water | balance to 100% |

The detergent active was provided by mixtures of various 1,2-diols and primary alkyl sulphate (PAS) with an alkyl chain length of 14 and 15 carbon atoms. The alkane 1,2-diols ranged from C₈ to C₁₈ chain length.

The compositions were added to 24°FH water at a concentration of 6g/litre giving wash liquors with a pH of 10. These were used to wash polyester test cloths soiled with radiolabelled triolein, as in the preceding example. Results were as follows:

| Ratio | PAS:DIOL | % Triolein Removal | | | | |
|-------|----------|---------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| | | <u>C₈ DIOL</u> | <u>C₁₀ DIOL</u> | <u>C₁₂ DIOL</u> | <u>C₁₄ DIOL</u> | <u>C₁₆ DIOL</u> |
| 30 | 100:0 | 34.9 | 38.4 | 38.4 | 38.4 | 38.4 |
| | 95:5 | - | - | - | - | 41.9 |
| 35 | 90:10 | - | 36.7 | 41.5 | 44.5 | 42.4 |
| | 85:15 | - | - | - | - | 42.9 |
| | 80:20 | 33.5 | 43.0 | 46.9 | 46.2 | - |
| 40 | 70:30 | 27.5 | - | - | 37.7 | 37.6 |
| | 60:40 | 27.4 | 45.0 | 23.3 | - | - |
| 45 | 50:50 | - | - | 11.9 | - | - |
| | 40:60 | - | 26.6 | 7.3 | 5.4 | 8.6 |
| | 30:70 | 19.3 | - | - | - | - |
| 50 | 20:80 | - | - | - | 2.2 | - |
| | 0:100 | 1.1 | 0.56 | - | 1.1 | 2.7 |

55 Example 3

The procedure of Example 2 was repeated using as detergent active various mixtures of C₁₂ 1,2-diol, primary alkyl sulphate with a chain length of 14 and 15 carbon atoms and Synp ronic A7 as used in Example 1.

The results (% triolein removal) are given in a table below. In this table the amounts of the individual surfactants are given as percentages of the total quantity of all three surfactants, which was 13% of the composition.

| | <u>PAS</u> | <u>Synperonic A7</u> | <u>C₁₂ 1,2-Diol</u> | <u>% Triolein Removal</u> |
|----|------------|----------------------|--------------------------------|---------------------------|
| 5 | 0 | 100 | 0 | 56.8 |
| | 15.4 | 84.6 | 0 | 25.5 |
| 10 | 30.8 | 69.2 | 0 | 11.4 |
| | 46.2 | 53.8 | 0 | 9.0 |
| | 69.2 | 30.8 | 0 | 9.3 |
| 15 | 92.3 | 7.7 | 0 | 22.2 |
| | 100 | 0 | 0 | 23.0 |
| 20 | 0 | 84.6 | 15.4 | 63.0 |
| | 15.4 | 69.2 | 15.4 | 41.4 |
| | 30.8 | 53.8 | 15.4 | 36.9 |
| 25 | 38.5 | 46.1 | 15.4 | 26.5 |
| | 42.3 | 42.3 | 15.4 | 27.8 |
| 30 | 41.1 | 38.5 | 15.4 | 33.7 |
| | 53.8 | 30.8 | 15.4 | 32.9 |
| | 61.5 | 23.1 | 15.4 | 26.8 |
| 35 | 69.2 | 15.4 | 15.4 | 15.6 |
| | 76.9 | 7.7 | 15.4 | 39.9 |
| 40 | | | | |
| 45 | | | | |
| 50 | | | | |
| 55 | | | | |

| | | | | |
|----|------|------|------|------|
| | 84.6 | 0 | 15.4 | 39.3 |
| | 61.5 | 15.4 | 23.1 | 29.3 |
| 5 | 0 | 69.2 | 30.8 | 55.2 |
| | 15.4 | 53.8 | 30.8 | 40.7 |
| 10 | 23.1 | 46.1 | 30.8 | 31.4 |
| | 30.8 | 38.4 | 30.8 | 36.5 |
| | 46.1 | 23.1 | 30.8 | 34.1 |
| 15 | 53.8 | 15.4 | 30.8 | 20.2 |
| | 61.5 | 7.7 | 30.8 | 21.9 |
| 20 | 69.2 | 0 | 30.8 | 28.9 |
| | 0 | 53.9 | 46.1 | 15.8 |
| | 15.4 | 38.5 | 46.1 | 23.5 |
| 25 | 30.8 | 23.1 | 46.1 | 28.0 |
| | 46.1 | 7.8 | 46.1 | 30.2 |
| | 53.9 | 0 | 46.1 | 7.6 |
| 30 | 0 | 46.2 | 53.8 | 3.7 |
| | 30.8 | 15.4 | 53.8 | 2.3 |
| 35 | 38.5 | 7.7 | 53.8 | 11.6 |
| | 30.8 | 7.7 | 61.5 | 6.0 |
| | 38.5 | 0 | 61.5 | 5.8 |
| 40 | 0 | 30.8 | 69.2 | 1.9 |

These results are also plotted on a triangular diagram which appears as Fig. 1.

As can be seen from this diagram's right-hand corner, there is synergistic enhancement of detergency with mixtures containing diol and PAS only. The maximum occurs at around a 4:1 ratio of diol : PAS. If a limited amount of Synperonic A7 is introduced into such a mixture, the synergistic enhancement is still observed, but if the amount of Synperonic A7 is more than about 10% of the three surfactants, or the amount of PAS is less than 70% the mixtures are outside the scope of the invention and give relatively poorer triolein removal.

Analogously, there is a synergistic enhancement of detergency for mixtures containing diol and Synperonic only. This is at the left-hand edge of the triangular diagram. If PAS is incorporated into such mixtures, detergency deteriorates. The requirements of this invention as stated originally circumscribe the area in which triolein removal is good.

Roughly in the centre of the diagram is an area of improved detergency, falling within the scope of this invention. However it gives slightly less triolein removal than the areas at the left and right sides of the diagram which may therefore be preferred.

Example 4

Aqueous wash liquors were prepared containing the following materials in deionized water.

| | | | |
|---|---------------------|---|--------------------|
| 5 | Alkyl polyglycoside | } | |
| | Dodecane 1,2-diol | } | one gram per litre |
| | | } | |
| | Sodium metaborate | | 0.05 molar |

10

These quantities would be typical of using 6g/litre of a detergent product containing 16.7% by weight surfactant. The wash liquors had a pH of about 10 resulting from the presence of the metaborate.

The alkylpolyglycoside was APG 300 from Horizon Chemical Co. This was of the formula



15 where R is a 9 to 11 carbon alkyl chain, G is glucose and x has an average value of 1.4. It had an HLB value of approximately 11 to 12. The dodecane 1,2-diol is available from Aldrich Chemical Co.

Wash liquors were prepared with various ratios of the two surfactants and used to wash polyester test cloths soiled with radiolabelled triolein. Washing was carried out at 40°C for 20 minutes in a Tergotometer.

The removal of triolein was determined and the results were:

20

| | Ratio | % Triolein removal |
|----|------------------|--------------------|
| | APG 300/1,2-diol | |
| 25 | 100/0 | 58.9 |
| | 95/5 | 60.2 |
| | 90/10 | 58.5 |
| 30 | 80/20 | 41.2 |
| | 60/40 | 4.5 |
| 35 | 40/60 | 2.2 |
| | 20/80 | 1.7 |
| | 0/100 | 1.7 |

40

Example 5

Example 4 was repeated using a different alkylpolyglycoside. APG 500 from Horizon was used. This has the formula

45



where R is C₁₂ and C₁₃ alkyl, G is glucose and x is 1.4. It had an HLB value of approximately 11.5 to 12.5. Results were:

50

55

| | Ratio | % Triolein removal |
|----|------------------|--------------------|
| 5 | APG 500:1,2-diol | |
| | 100:0 | 45.3 |
| | 90:10 | 54.1 |
| 10 | 80:20 | 37.1 |
| | 60:40 | 6.2 |
| | 40:60 | 2.3 |
| 15 | 20:80 | 1.8 |
| | 0:100 | 1.7 |

20 Example 6

The procedure of Example 1 was repeated using as detergent active various proportions of an alkylpolyglycoside and Dodecane 1,2-diol. The alkylpolyglycoside was APG 550 from Horizon. This is of the general formula

25 $RO(G)_x$
 where R is a 12 and 13 carbon atom alkyl chain, G is glucose and x has an average value of 1.8. It had an HLB value of approximately 12 to 13.

The compositions were added to 24°FH water at a concentration of 6g/litre. The resulting wash liquors had a pH of 10 and were used to wash polyester test cloths as in previous Examples. The cloths came from a different batch; consequently these figures cannot be compared directly with the results from Example 1.
 30 Results were:

| | Ratio | % Triolein removal |
|----|------------------|--------------------|
| 35 | APG 550:1,2-diol | |
| | 100:0 | 43.5 |
| 40 | 92:8 | 58.0 |
| | 85:15 | 32.2 |
| | 69:31 | 5.9 |
| 45 | 54:46 | 2.6 |

Example 7

50 The previous Example 6 was repeated, using various mixtures of Synperonic A7 and APG 550 as the nonionic surfactant. The results, including these of the previous Example are given in the following table in which the amounts of APG 550, Dodecane 1,2-diol and Synperonic A7 are expressed as percentages of the total quantity of all three (which was a constant 13% of the overall composition). The results are also plotted as a triangular diagram which appears as Fig. 2.

55

| | APG 550 | Synperonic A7 | C ₁₂ 1,2 Diol | % Triolein Removal |
|----|---------|---------------|--------------------------|--------------------|
| 5 | 0 | 100 | 0 | 68.9 |
| | 15.4 | 84.6 | 0 | 66.9 |
| | 30.8 | 69.2 | 0 | 64.2 |
| 10 | 50.0 | 50.0 | 0 | 62.5 |
| | 69.2 | 30.8 | 0 | 57.4 |
| | 100 | 0 | 0 | 43.5 |
| 15 | 80.8 | 11.5 | 7.7 | 63.3 |
| | 92.3 | 0 | 7.7 | 58.0 |
| 20 | 0 | 84.6 | 15.4 | 74.5 |
| | 23.1 | 61.5 | 15.4 | 68.0 |
| | 53.8 | 30.8 | 15.4 | 63.8 |
| 25 | 69.2 | 15.4 | 15.4 | 58.5 |
| | 84.6 | 0 | 15.4 | 32.2 |
| | 0 | 69.2 | 30.8 | 62.7 |
| 30 | 15.4 | 53.8 | 30.8 | 59.2 |
| | 23.1 | 46.1 | 30.8 | 55.0 |
| 35 | 38.4 | 30.8 | 30.8 | 47.8 |
| | 69.2 | 0 | 30.8 | 5.9 |
| | 0 | 53.8 | 46.2 | 13.6 |
| 40 | 23.1 | 30.8 | 46.2 | 11.3 |
| | 38.4 | 15.4 | 46.2 | 8.7 |
| 45 | 53.8 | 0 | 46.2 | 2.6 |

It can be seen from this triangular diagram that for all proportions of APG 550: Synperonic A7, there is a mixture with diol which gives greater triolein removal than without the diol.

50 Example 8

Compositions were prepared having as a general formulation:

55

| | | % by weight |
|----|------------------------------|-------------|
| | Detergent active | 17 |
| 5 | Zeolite | 32 |
| | Sodium silicate | 0.8 |
| | Sokolan CP5 | 4.0 |
| 10 | Sodium carbonate (anhydrous) | 14.5 |
| | Sodium metaborate | 16.5 |

15 The detergent active was provided by various proportions of alkylpolyglycoside, and dodecane 1,2-diol and coconut alkyl sulphate (PAS). The alkylpolyglycoside was APG 600 from Horizon (also available as Plantaren APG 600 from Henkel). This is of the general formula



20 where R is a coconut alkyl chain (i.e. principally C₁₂ and C₁₄), G is glucose and x has an average value of 1.4. It has an HLB value of approximately 12.

The compositions were added to 24° FH water at a concentration of 5 g/litre and used to wash polyester test cloths by the procedure as in Examples 1 and 2.

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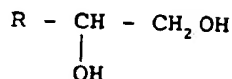
Results were:

| | Ratio | | | % Triolein removal |
|----|-------|-----------|------------|--------------------|
| | PAS | : APG 600 | : 1,2-diol | |
| 5 | 0.0 | 100.0 | 0.0 | 60.3 |
| 10 | 25.0 | 75.0 | 0.0 | 49.2 |
| | 50.0 | 50.00 | 0.0 | 50.1 |
| | 75.0 | 25.0 | 0.0 | 46.5 |
| 15 | 100.0 | 0.0 | 0.0 | 53.8 |
| | 0.0 | 93.0 | 7.0 | 66.7 |
| 20 | 9.3 | 83.7 | 7.0 | 59.1 |
| | 93.0 | 0.0 | 7.0 | 61.0 |
| | 0.0 | 86.0 | 14.0 | 70.0 |
| 25 | 17.2 | 68.8 | 14.0 | 63.3 |
| | 51.6 | 34.4 | 14.0 | 58.7 |
| | 68.8 | 17.2 | 14.0 | 54.7 |
| 30 | 86.0 | 0.0 | 14.0 | 58.0 |
| | 0.0 | 79.0 | 21.0 | 64.1 |
| 35 | 15.8 | 63.2 | 21.0 | 63.6 |
| | 39.5 | 39.5 | 21.0 | 61.2 |
| | 51.7 | 27.3 | 21.0 | 55.1 |
| 40 | 79.0 | 0.0 | 21.0 | 52.0 |
| | 45.5 | 19.5 | 35.0 | 45.4 |
| 45 | 29.0 | 29.0 | 42.0 | 27.1 |
| | 0.0 | 51.0 | 49.0 | 7.8 |
| | 51.0 | 0.0 | 49.0 | 13.9 |
| 50 | 0.0 | 30.0 | 70.0 | 1.7 |
| | 30.0 | 0.0 | 70.0 | 3.0 |

55 Again it can be seen that incorporation of diol in limited amounts leads to improved triolein removal.

Claims

1. A detergent composition containing 2 to 50% by weight of a surfactant mixture which comprises
 i) a 1,2 diol of the general formula



where R is a saturated or unsaturated hydrocarbon group containing 8 to 16 carbon atoms,
 ii) one or more surfactants selected from
 a) primary alkyl sulphates of formula



in which Rⁿ is a saturated, unsubstituted, branched or straight chain primary alkyl or alkenyl group containing 8 to 18 carbon atoms and M is a solubilizing cation; and/or

b) nonionic surfactants with an HLB value of 10.5 or above; with the amounts by weight of (i), (a) and (b) such that either the amount of (b) is greater than 50% of (i) and (ii)

in which case (i) is from 5 to 40% of (i) and (ii) while (a) is not more than 25% of (i) and (ii), with the proviso that (i) is at least 10% of (i) and (ii) if (a) is from 15 to 25% of (i) and (ii); or the amount of (b) is less than 40% of (i) and (ii)

In which case (i) is at least 5% of (i) and (ii) while (a) is at least 70% of (i) and (ii) and (b) is less than 10% of (i) and (ii) or else (i) is from 20 to 40% of (i) and (ii) while (a):(b) ranges from 40:60 to 70:30;

and with the proviso that the amount by weight of any anionic non-soap surfactant in the composition, other than any said primary alkyl sulphate (a) is less than half the amount of said primary alkyl sulphate (a).

2. A detergent composition according to claim 1 wherein the hydrocarbon group R is an alkyl or alkenyl group of 8 to 16 carbon atoms.

3. A detergent composition according to any one of the preceding claims wherein the nonionic surfactant (b) is ethoxylated primary alcohol.

4. A composition according to any one of claims 1 to 3 wherein amounts by weight are such that:
 (i):(ii) ranges from 35:65 to 95:5 while the amount of (b) is at least 8 times the amount, if any, of (a).

5. A composition according to any one of claims 1 to 3 wherein the amounts by weight are such that:
 (i):(ii) ranges from 25:75 to 95:5 while the amount of (a) is at least 9 times the amount, if any, of (b).

6. A detergent composition according to any one of the preceding claims which also contains 7 to 70% by weight of detergency builder.

7. A method of cleaning which comprises contacting fabrics or other inanimate surface to be cleaned with a composition according to any one of the preceding claims, or a wash liquor comprising water and a composition according to any of the preceding claims added to the water in a quantity lying in a range from 0.5 to 50 grams per litre of water.

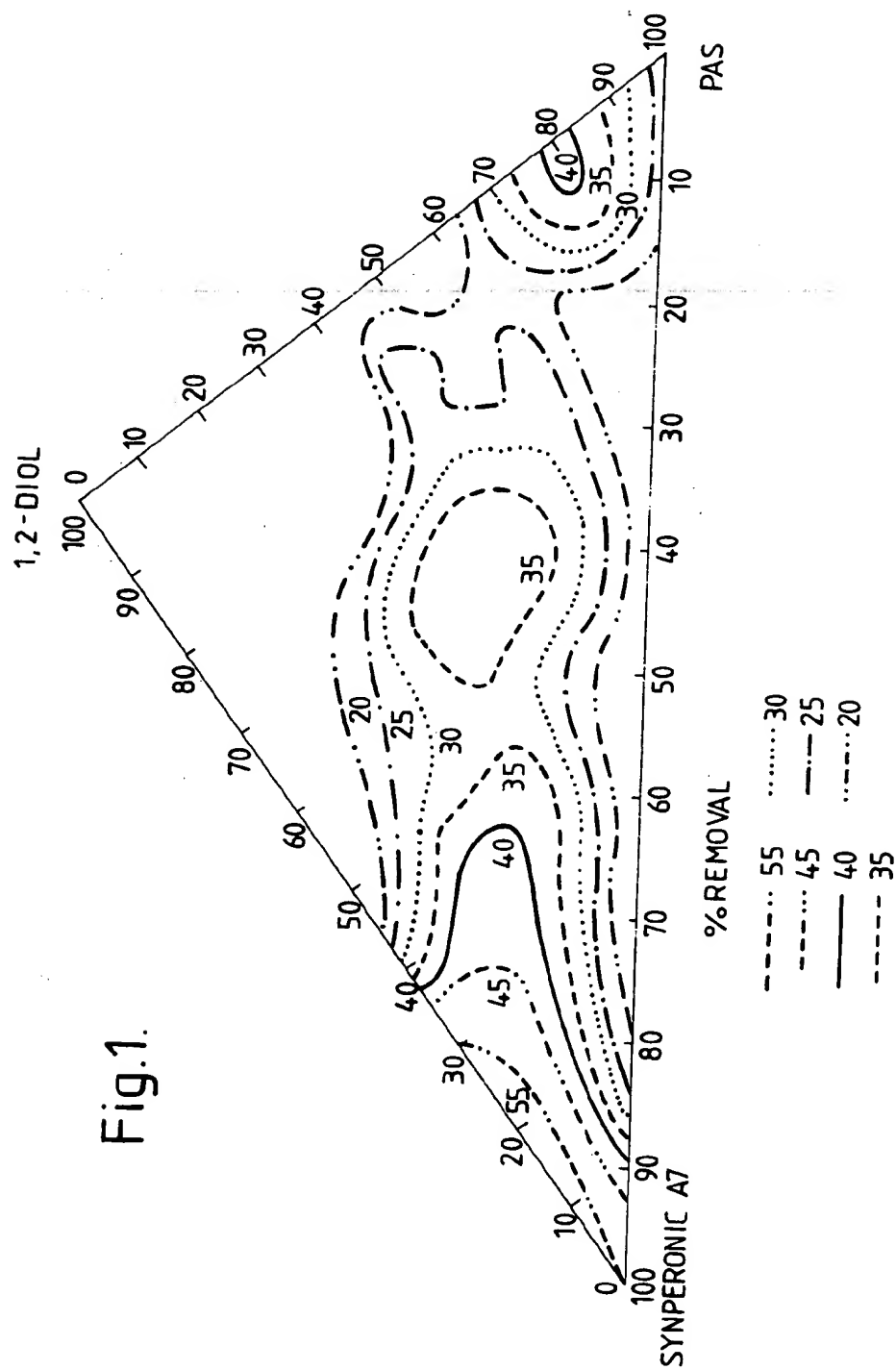
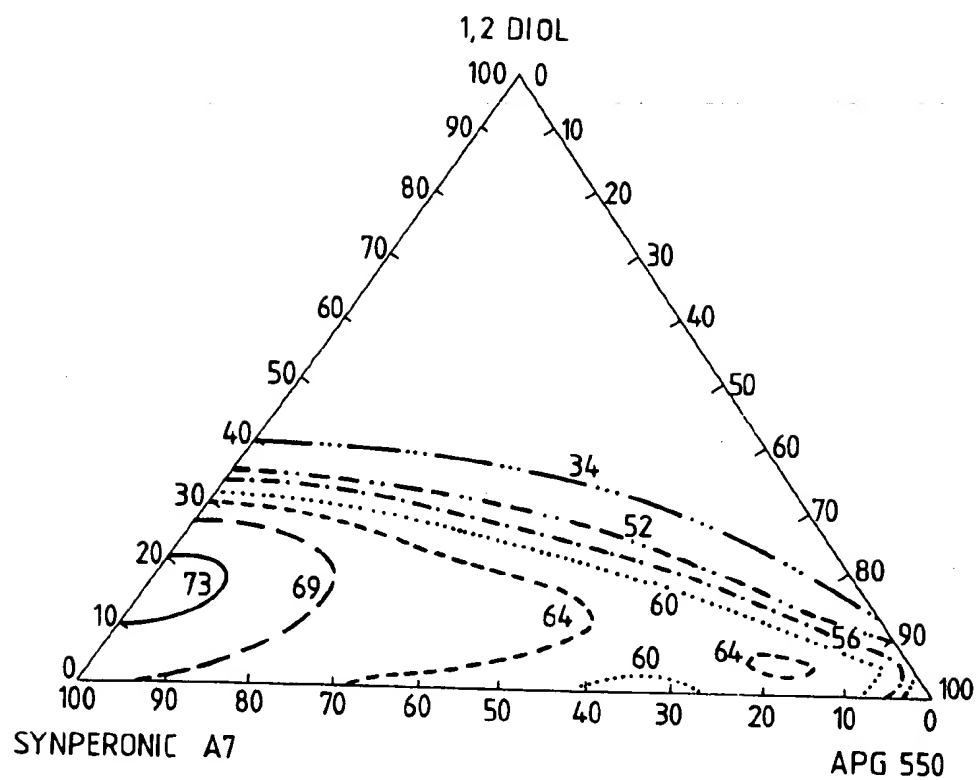


Fig. 2.



% REMOVAL

- 73.0
- - - 68.7
- - - 64.4
- 60.1
- · - · - 55.8
- · - · - 51.5
- 34.25



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 91 31 1635

| DOCUMENTS CONSIDERED TO BE RELEVANT | | | |
|--|--|---|---|
| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (Int. Cl.5) |
| X | WO-A-9 009 427 (HENKEL) * page 3, line 16 - page 8, line 8; claims 1-5 * | 1-6 | C1101/68 C1101/83 C1101/825 |
| X | US-A-2 679 482 (J. ROSS) * claims 1,2,6-8,21,24; examples 2,3 * | 1,2,5,6 | |
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| X | US-A-3 766 062 (H.E. WIXON) * column 4, line 30 - line 50; example 1 * | 1-3,6 | |
| A | US-A-3 705 113 (S.H. SHARMAN) * claims; examples 7-10 * | 1,2,5,6 | |
| | | | TECHNICAL FIELDS SEARCHED (Int. Cl.5) |
| | | | C11D |
| The present search report has been drawn up for all claims | | | |
| Place of search THE HAGUE | | Date of completion of the search 11 MARCH 1992 | Examiner GRITTERN A.G. |
| <p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons * : member of the same patent family, corresponding document</p> | | | |

EPO FORM 1503 (01.82) (P0461)